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NOTES

Organisms Encountered in Urine Cultures over a 10-Year Period

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Urinary isolates from 1961 to 1970 were surveyed. Forty-four different species were encountered in urine cultures. The most frequently isolated were *Escherichia coli*, *Klebsiella*, enterococci, *Pseudomonas aeruginosa*, and *Proteus mirabilis*.

A survey of the organisms isolated from urine at the University of Minnesota Hospitals was taken during the period of 1961 to 1970. During 1961 to 1966, urine was diluted 1:100 in saline, and 0.1 ml of this dilution was used as the inoculum. From 1967 to 1970, a 0.001-ml calibrated platinum loop (4) was used to inoculate sheep blood-agar (Trypticase soy agar, BBL) and Levine's eosin-methylene blue or MacConkey agar. The inocula were spread over the plates so that colonies could be counted. Most urine specimens were obtained by the clean-catch technique, with an undetermined number being obtained by catheterization or suprapubic aspiration. For this study, no attempt was made to assess the clinical significance of the culture results. Although we realize that the importance of the figure (100,000 colonies per ml) as delineated by Kass (2) is not applicable to all specimens, most of the data given here will apply to organisms found in this quantity.

Table 1 shows the total number of urine cultures made each year and the number and percentage of positive cultures. Although the percentage of positive cultures has increased in recent years, the organisms accounting for more than 95% of the isolates in amounts of 100,000/ml or greater have stayed the same (Table 2). *Escherichia coli* was the predominant isolate, being present in approximately 33% of the positive cultures. The next most common were *Klebsiella*, alpha streptococci (predominantly group D), *Proteus mirabilis*, and *Pseudomonas aeruginosa*. These results are very similar to those reported by Roupas and Piguet from Switzerland (3). Since 1966, there has been a slight decrease in *E. coli* isolates, and from 1964 to 1968 there was an increase in *Klebsiella-Enterobacter*. Since 1967, there has been an increase in the percentage of *P. aeruginosa* and *Candida albicans*. This may well be a reflection of the increased number of immunodeficient patients in our hospital. About 75% of the major isolates were gram-negative organisms, a figure which is also similar to the results of Roupas and Piguet (3).

The 14 organisms listed in Table 2 account for more than 95% of all isolates present in quantities of 100,000/ml or greater in urine cultures. These same 14 organisms also account for the great majority of isolates present in quantities less than 100,000/ml, although *P. mirabilis*, alpha streptococci, and diphtheroids were second only to *E. coli* in this lower quan-

TABLE 1. *Percentage of positive urine cultures, 1961 to 1970*[a]

Year	No. of cultures	No. of positive cultures[b]	Positive cultures (%)
1961	9,163	2,927	31.5
1962	8,775	2,704	30.8
1963	9,012	2,504	27.8
1964	11,334	2,886	25.4
1965	13,671	4,814	35.2
1966	13,938	5,989	43.0
1967	13,492	5,345	39.6
1968	16,005	6,226	38.9
1969	19,582	8,881	45.3
1970	22,644	10,611	46.9

[a] May include more than one culture per patient.
[b] Includes those positive for any number of organisms.

TABLE 2. *Organisms most commonly isolated from urine, 1961 to 1970*[a]

Organism	Percentage of all organisms isolated										
	1961	1962	1963	1964	1965	1966	1967	1968	1969	1970	10-Year total
Escherichia coli	34.2	39.0	37.5	36.3	34.9	35.9	33.8	30.0	31.1	30.8	33.9
Klebsiella-Enterobacter[b]	16.0	15.2	16.8	23.6	24.0	22.4	24.4	27.1	20.2	18.6	21.7
Klebsiella						11.8	21.1	23.2	16.2	14.4	18.6[c]
Enterobacter						2.0	3.3	3.9	4.0	4.2	3.9[c]
Proteus (all species)	13.8	13.5	11.6	11.3	13.9	14.3	12.9	11.1	11.8	11.8	12.6
Proteus mirabilis[d]						11.2	10.2	9.1	9.8	8.7	9.8[e]
Alpha streptococcus	12.3	6.3	10.0	9.5	9.5	11.0	9.9	9.4	11.6	11.2	9.9
Pseudomonas aeruginosa	7.9	7.3	7.0	5.8	6.3	6.9	7.1	9.4	9.5	10.2	7.3
Staphylococcus (coagulase-negative)	3.3	4.0	5.0	3.3	3.1	2.1	2.8	3.9	3.3	3.3	3.4
Diphtheroids	1.7	2.8	2.3	1.3	2.1	1.4	1.2	1.7	3.7	3.9	2.3
Staphylococcus (coagulase-positive)	3.6	3.9	2.9	2.2	1.8	1.4	1.3	1.1	1.2	1.1	1.9
Providence	3.1	2.4	1.9	1.9	1.6	1.4	0.8	0.5	1.0	0.9	1.4
Beta streptococcus	1.2	1.0	1.0	0.1	0.7	1.0	1.1	0.8	1.0	0.9	0.9
Candida albicans	0.1	0.1	0.1	0.1	0.1	0.7	1.5	1.8	1.1	3.7	0.5
Total isolates (%)	97.1	95.4	96.0	95.3	97.9	97.0	96.8	96.8	95.5	96.9	95.8

[a] Includes only organisms present in amount of 100,000 colonies/ml or more. May include more than one culture per patient.
[b] Not routinely separated until mid-1966.
[c] Four-year average, 1967 to 1970.
[d] Not routinely speciated until 1966.
[e] Five-year average, 1966 to 1970.

tity range. Overall, we have encountered 44 different organisms from urine during this 10-year period. Other isolates found less frequently include *Alcaligenes*, other *Candida* species, *Citrobacter*, *Cryptococcus*, *Diplococcus pneumoniae*, EO-1, *Flavobacterium*, *Geotrichum*, *Herbicola* (*Erwinia*), *Lactobacillus*, *Mima*, *Neisseria*, *Pasteurella*, other *Pseudomonas* species, *Salmonella*, *Shigella*, *Torulopsis*, and unidentified yeasts.

We have found it a useful epidemiological tool to keep a record of all organisms isolated in our hospital. For example, EO-1 isolates were not seen until late in 1968 and early 1969, when 22 strains were found in amounts greater than 100,000/ml. This seemed very unusual and led to the discovery of contaminated detergent in the disposable urinary catheter kits being used (1). Since this problem was corrected, the organism has not been isolated again from urine. By continued surveillance of urinary isolates, the laboratory staff can be alerted to other potential problems which may arise.

There is little in the literature which gives a complete listing of organisms isolated from urine in hospital laboratories. The data given here are presented in order to recapitulate 10 years of experience, to point out the similarities and changes, and to serve as a basis for comparison in other clinical laboratories. Assessing the results of others is often helpful in defining possible deficiencies or excesses.

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LITERATURE CITED

1. Hardy, P. C., G. M. Ederer, and J. M. Matsen. 1970. Contamination of commercially packaged urinary catheter kits with the pseudomonad EO-1. N. Engl. J. Med. **282**:33-35.
2. Kass, E. H. 1957. Bacteriuria and the diagnosis of infections of the urinary tract. Arch. Intern. Med. **100**:709-714.
3. Roupas, A., and J. D. Piguet. 1968. Sensibilite aux antibiotiques de 2081 souches bacteriennes, isolees d'infections urinaries. Schweiz. Med. Wochenschr. **98**: 2008-2016.
4. Shaw, S. T., Jr., M. Hopp, and J. W. St. Geme, Jr. 1966. Quantitative urine culture with calibrated bacteriologic loop. Minn. Med. **49**:749-751.